SCREENING REPORT

SYDNEY LANDFILL
LEACHATE MANAGEMENT PROJECT
SYDNEY, NOVA SCOTIA

ENVIRONMENT CANADA

AUGUST 2001

PROJECT INFORMATION

Project Name:	Sydney Landfill Site, Leachate Management Project
Project Location:	Sydney Landfill portion of the Municipal Ash Industrial Disposal (MAID) Site located in the Muggah Creek watershed, Cape Breton Regional Municipality, Nova Scotia
Purpose of the Project:	To manage leachate from the Sydney Landfill by permanently closing the site
Responsible Authority:	Environment Canada
Environmental Assessment Trigger:	Authorizing payments to the proponent for the purpose of enabling the project
Environmental Assessment Process	Screening of the project and preparation of a screening report
Environmental Assessment Start Date:	March 20, 2001
Project Proponent:	Cape Breton Regional Municipality

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SUMMARY OF THE ASSESSMENT

The former City of Sydney began waste disposal operations sometime in the 1950s at the Sydney Landfill. Since that time an estimated one million tonnes of waste have been disposed of at the site.

The landfill, situated in the center of the former city, is immediately east of the Coke Ovens site, a 60 hectare parcel of industrial land containing contaminated soils, groundwater and surface waters, abandoned structures, and residual materials. West of the Coke Ovens site are the Sydney Tar Ponds, containing approximately 700,000 tonnes of contaminated sediments. The community-based Joint Action Group for Environmental Clean-up of the Muggah Creek Watershed (JAG), together with the Government of Canada, the Province of Nova Scotia, and the Cape Breton Regional Municipality are committed to finding solutions to the environmental and health risks arising from contamination in the Muggah Creek watershed. Contained within the watershed are the landfill, the Coke Ovens site, and the Tar Ponds.

One of the projects recommended by JAG and under consideration by government is managing leachate from the Sydney Landfill. The goal is to close the landfill in order to minimize the amount of leachate that leaves the site; provide effective control over landfill gases; control surface water on the site; provide for long-term site monitoring; provide controlled access to the site; and enhance site aesthetics. The project will include:

- site preparation - re-grading the site;
- installation of a final cover system;
- installation of a barrier wall between landfill wastes and an adjacent pond;
- diversion of Coke Ovens Brook which crosses the site;
- installation of a leachate collection system;
- characterization of remaining leachate;
- installation of a passive landfill gas management system; and
- ancillary activities/facilities.

Environment Canada was responsible for ensuring an environmental assessment of the proposed project was completed in accordance with the requirements of the *Canadian Environmental Assessment Act*. This screening report is one requirement. The assessment identified potential environmental effects, both positive and adverse, resulting from the project, cumulative effects that could develop in conjunction with other proposed projects, as well as effects arising from accidents and malfunctions. The assessment also identified practical and effective measures to minimize any potential adverse effects.

A draft screening report was reviewed and commented upon by governments and the public. All written comments received during the review period were considered in finalizing this report.

Based on the information gathered Environment Canada has concluded that the project is not likely to cause significant adverse environmental effects.

SOMMAIRE DE L'ÉVALUATION

L'ancienne ville de Sydney a entrepris des opérations d'élimination des déchets dans les années 1950 à la décharge de Sydney. Depuis, on estime qu'environ un million de tonnes de déchets y ont été éliminées.

La décharge, qui est située au centre de l'ancienne ville, se trouve immédiatement à l'est des fours à coke, une parcelle de terrain de 60 hectares jadis utilisée à des fins industrielles où il y a des sols, de l'eau de surface et de l'eau souterraine contaminés, des structures abandonnées et du matériau résiduel. À l'ouest du site des fours à coke se trouvent les étangs de goudron de Sydney qui contiennent environ 700 000 tonnes de sédiments contaminés. En collaboration avec le gouvernement du Canada, la province de la Nouvelle-Écosse, la municipalité régionale du Cap-Breton (MRCB) et le groupe communautaire désigné le Groupe d'action conjointe (GAC) pour l'assainissement environnemental dans le bassin hydrographique du ruisseau Muggah sont déterminés à trouver des solutions aux problèmes environnem aux et aux risques pour la santé attribuables à la contamination du bassin hydrographique du ruisseau Muggah où sont situés la décharge, le site des fours à coke et les étangs de goudron.

Un des projets recommandés par le GAC et actuellement à l'étude par ses partenaires des divers paliers de gouvernement est un projet de gestion du lixiviat de la décharge de Sydney. Ce projet vise à fermer la décharge afin de minimiser la quantité de lixiviat qui en découle; de mieux contrôler les gaz émanant de la décharge; de contrôler l'eau de surface sur le site; de permettre une surveillance du site à long terme; de contrôler l'accès au site et d'améliorer l'apparence physique du site. Le projet comportera les volets suivants :

- préparation du site - travaux de déblai et de remblai;
- installation d'un système de couverture finale;
- installation d'une paroi entre les déchets de la décharge et un étang adjacent;
- déviation du ruisseau des fours à coke qui traverse le site;
- installation d'un système de collecte du lixiviat;
- caractérisation du lixiviat restant;
- installation d'un système passif de gestion des gaz de la décharge;
- activités et installations auxiliaires.

Environnement Canada était chargé de veiller à ce qu'une évaluation environnementale du site du projet soit entreprise conformément à la *Loi canadienne sur l'évaluation environnementale*. Une des dispositions de la Loi prescrivait l'établissement du rapport d'examen préalable ci-joint. L'évaluation a permis de déterminer les incidences environnementales positives et néfastes éventuelles des activités entreprises dans le cadre du projet, les effets cumulatifs susceptibles de se produire si d'autres projets sont entrepris et les effets que pourraient avoir des défauts de fonctionnement de dispositifs ou des accidents. Les résultats de l'évaluation ont aussi aidé à déterminer quelles mesures pratiques et efficaces permettraient de minimiser les incidences néfastes éventuelles.

Le rapport d'évaluation provisoire a fait l'objet d'un examen et de commentaires de la part des représentants gouvernementaux et du public. Tous les commentaires reçus durant la période d'examen ont été pris en considération dans la préparation de la version définitive du rapport.

D'après l'information recueillie par Environnement Canada, il est peu probable que le projet ait des incidences environnementales néfastes considérables.

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1.0 INTRODUCTION

In the early 1900s wastes from the steel plant in Sydney, Nova Scotia were disposed of in a boggy area that became known as the Marsh Dump. Sometime in the 1950s municipal waste disposal operations were begun in the 23 hectare western portion of the Marsh Dump, an area now known as the Sydney Landfill (the Site). About 1987, municipal waste processing and ash disposal began in the central and eastern portions of the Marsh Dump referred to in the remainder of this report as the CBRM site. In 1997, the current municipal government, Cape Breton Regional Municipality (CBRM), began ash landfill operations east of the Marsh Dump and continued other waste processing activities in other areas. The Marsh Dump now forms the base of the CBRM's solid waste disposal facility which is called the Municipal Ash Industrial Disposal (MAID) site. The closure of the Sydney Landfill portion of the MAID site is the subject of this environmental assessment.

Figure 1 illustrates the location of the Site and surrounding areas. Figure 2 illustrates ownership of the Site.

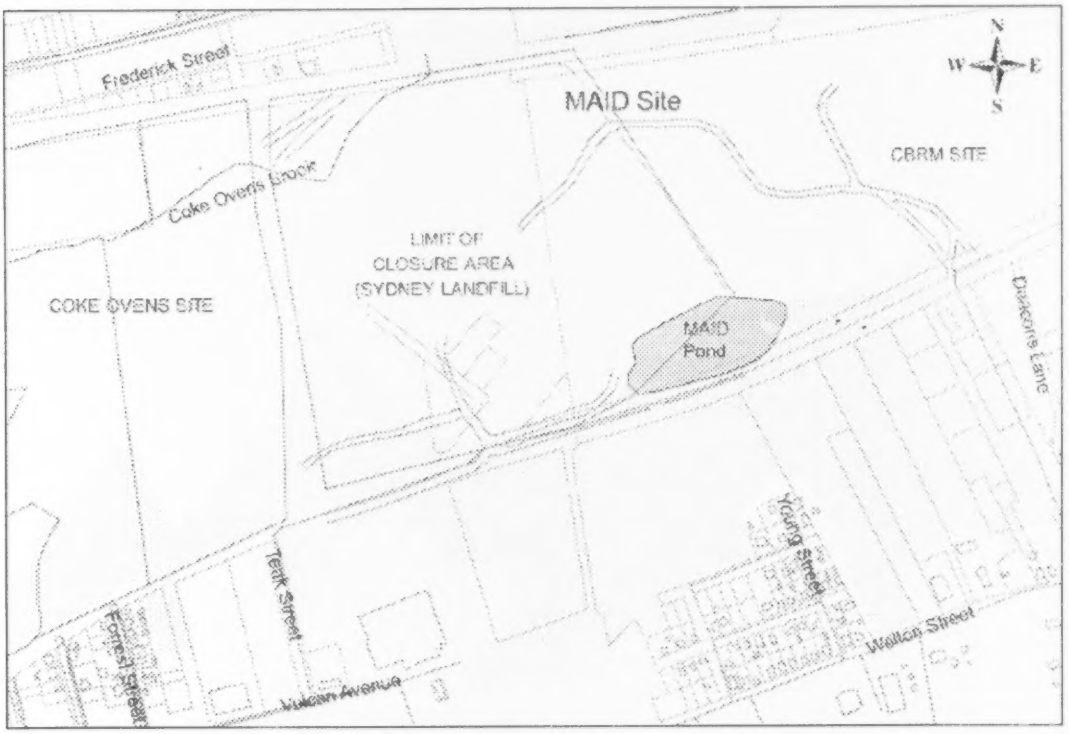
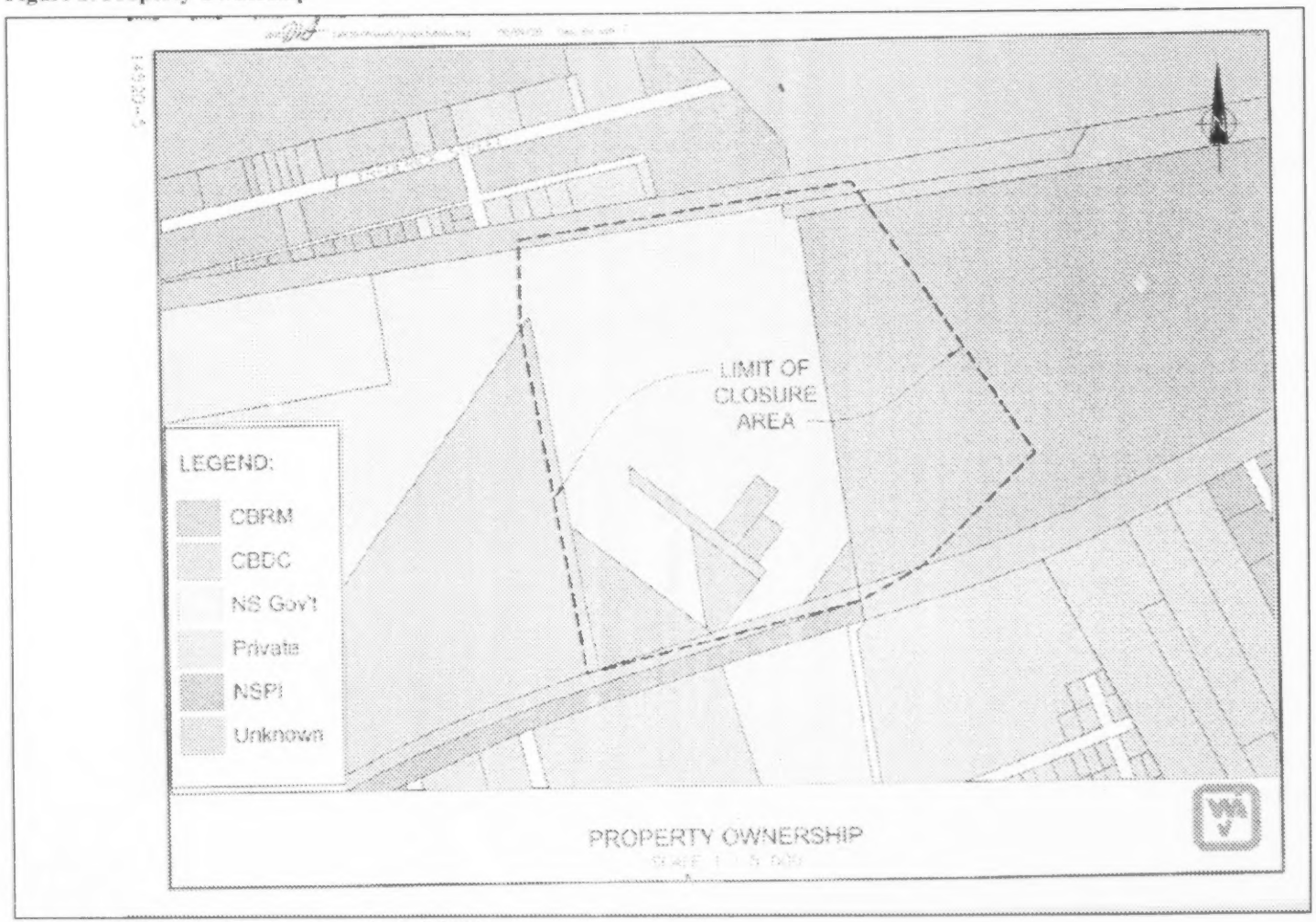


Figure 1. Site Location

Little documentation exists on the types of wastes or waste quantities received by the Sydney Landfill. In 1986, it was apparently receiving wastes at an estimated rate of about 110 tonnes per day. The total amount of waste at the Site is estimated to be one million tonnes, deposited over approximately 35 years.

The Sydney Landfill is located within the Muggah Creek watershed, which is situated in the center of the former City of Sydney, Nova Scotia. Immediately west of the Site is the Coke Ovens site, a 60 hectare

Figure 2. Property Ownership



(from Jacques Whitford Environment Limited 2000)

parcel of industrial land containing contaminated soils, groundwater and surface waters, abandoned structures, residual materials. West of the Coke Ovens are the Sydney Tar Ponds which contain approximately 700,000 tonnes of contaminated sediments.

The community-based Joint Action Group for the Environmental Clean-up of the Muggah Creek Watershed (JAG), together with the Government of Canada, the Province of Nova Scotia, and CBRM, are committed to finding solutions to the environmental and potential health risks arising from Tar Ponds/Coke Ovens contamination. JAG's responsibilities include providing governments with recommendations relating to the restoration of the Tar Ponds/Coke Ovens. Government responsibilities include funding and implementation of approved projects. One project recommended by JAG and presently under consideration by Environment Canada and other government parties is the one subject to this environmental assessment--managing leachate (wastewater that has percolated through the landfill waste material) from the Sydney Landfill site.

The federal government is represented in the JAG process by Health Canada and Environment Canada. The provincial government is represented by the Departments of Health and Transportation & Public Works. CBRM, which includes the former City of Sydney, is the municipal-level government party. Federal funding is administered by Environment Canada.

The Membertou Band is a tribal group of the Mi'kmaq Nation. The community of approximately 1000 residents is situated on 45 hectares of land located approximately 4 km southwest of the Sydney Landfill Site. The Sydney area is the traditional home of Membertou and is host to a broad representation of people from the entire Mi'kmaq Nation. The harbour and surrounding lands were used for hunting, fishing, transportation and ceremonial purposes, and comprised both seasonal and permanent settlement lands. The Mi'kmaq place historical value on Sydney Harbour and adjacent lands including the Muggah Creek watershed but they are not directly represented in the JAG process. Environment Canada has worked with, and will continue to work with, Membertou and other representatives of the Mi'kmaq to ensure the interests of aboriginals are respected in the planning for the restoration of the Tar Ponds/Coke Ovens site and during the implementation of remediation plans. Mechanisms to accomplish this goal are in development but will likely include some combination of providing business opportunities consistent with the federal government's *Procurement Strategy for Aboriginal Business* and establishing a meaningful role in future environmental assessment activities.

1.1 Purpose of the Project

This project falls under the *Canada/Nova Scotia/Cape Breton Regional Municipality Cost-Share Agreement in Support of the Environmental Clean-up of the Sydney Tar Ponds and Coke Ovens Sites in the Muggah Creek Watershed, Sydney Nova Scotia*. The purpose of the project is to manage leachate from the Sydney Landfill by permanently closing the Site. Specific objectives of closing the Site are to:

- minimize the amount of leachate that leaves the Site;
- provide effective control over landfill gases;
- control surface water on the Site;
- provide for long term Site monitoring;
- provide controlled access to the Site; and
- enhance Site aesthetics.

1.2 Project Alternatives

Three alternatives were considered for the project:

1) *"Do Nothing" Alternative* - Leaving the Site as it currently exists was rejected as it would not achieve the purposes of the project.
2) *Permeable Cover Alternative* - This alternative encourages increased biological activity by recirculating collected leachate repeatedly through a permeable cover, into the landfill. This alternative was rejected because of certain Site characteristics:
    - There would be difficulty in distributing the leachate uniformly throughout the non-homogeneous waste found at this Site. Varying levels of waste compaction, differing types of daily cover materials used when the Site was active, the overall size of the Site and highly variable hydraulic conductivities of the waste present problems for an even distribution of the leachate required to achieve the same level of biological activity throughout the landfill.
    - Landfill gas generation would be expected to increase from the elevated level of biological activity. The higher gas generation may result in the need for a more robust gas management system than would be the case if the Site were not subjected to leachate recirculation.
    - Increased capital and operating costs would be expected for the leachate pumping and injection systems, and for maintenance of the cover system as settlement occurs at a more rapid rate than if leachate recirculation were not practiced.
3) *Non-permeable Cover Alternative* - This traditional approach to landfill closure significantly restricts the amount of precipitation that infiltrates the waste deposits. The cover reduces the generation of leachate but the waste remains essentially intact as settlement and other forces act on the Site. The same level of leachate management would not be required as would be the case with a permeable cover. This alternative was chosen as the most appropriate for the Sydney Landfill.

The project design has evaluated numerous alternatives to components of the project, as well as the potential environmental effects and improvements associated with these alternatives. Where alternatives were considered, it is noted in this report (see Section 3.0 Project Description). Project design alternatives that are still outstanding are discussed.

1.3 Project Proponent and Agents of the Proponent

The project proponent is the Cape Breton Regional Municipality, operator of the Sydney Landfill. CBRM, through the Nova Scotia Department of Transportation & Public Works, has retained Vaughan Engineering Limited to complete the engineering design and construction contract documents for the closure. Vaughan Engineering Limited has also been retained to conduct construction oversight activities. Conestoga-Rovers & Associates is the Project Management Consultant (PMC) for a number of JAG recommended projects, including this one. On-site work will be conducted by contractors. CBRM will be responsible for the Site during the post-closure period.

1.4 Scope of the Project

The project will include:

- site preparation - re-grading the Site, including the steep north slope;
- installation of a final cover system - using one of two options for cover materials;

- installation of the MAID Pond barrier wall;
- diversion of Coke Ovens Brook;
- installation of a leachate collection system;
- characterization of remaining leachate;
- installation of a passive landfill gas management system; and
- ancillary activities / facilities - traffic management, access control, pest control, erosion control and storm-water management, and health and safety considerations.

The majority of landfill closure activities will occur within the Site boundaries. It will be necessary, however, to conduct some work (for example, leachate collection trenches and Coke Ovens Brook diversion) both on-site and on immediately adjacent lands. All of these activities fall within the scope of the project.

Suitable cover materials (clay, sand, gravel, topsoil, and possibly slag) will be excavated and brought to the Site from sources elsewhere in the region. Existing operations will provide all cover materials and these operations will have valid approvals issued by the appropriate provincial and municipal authorities. Activities at these sites will not be included within the project under assessment. Trucking of all cover materials to the Site will be considered part of the project.

Temporal boundaries of the project include all activities listed above. Although the design and construction of a leachate treatment system may occur within the temporal boundaries of this project, this aspect of the project is not included as there is insufficient information available.

The project, as described, does not include activities related to the still-active parts of the MAID Site.

1.5 Project Schedule

This project is scheduled to commence in August 2001 and to be completed by fall 2002. Presently, the proponent anticipates that the western half of the Site will be capped during the fall construction season, followed by re-contouring the north slope of the Site in late 2001. The remainder of the work will occur during the spring, summer, and fall of 2002. Delays may result in some activities being carried over into 2003.

1.6 Environmental Assessment of the Project

The environmental assessment of the closure of the Sydney Landfill included the release of a project Discussion Document in April 2001--that among other objectives met the requirements of CEAA's Federal Coordination Regulations--and the release of a draft screening report in May 2001 (see Section 6 for additional information). Responses to these documents received from the public, government, and others were considered in the preparation of this report. The report addresses the environmental effects of the proposed project including an assessment of cumulative effects that could develop in conjunction with other projects, and effects arising from accidents or malfunctions. Consideration is given to mitigation measures that are technically and economically feasible.

The descriptions of activities and related requirements provided in the remainder of this report reflect the current expectations for the project. The project is complex and modifications brought about by receipt of additional information through the tendering process or elsewhere are inevitable. Modifications will be addressed by evaluating the potential for new environmental effects and the effectiveness of existing

measures to mitigate those effects. Major changes to procedures that re-define the project may impose additional assessment obligations on Environment Canada.

1.7 Sources of Information

Much of the information provided in this report is taken directly from the reports listed below. The contributions are acknowledged. Other sources of information used in conducting the assessment are referenced throughout the document.

Sydney Landfill Design Reports (2001)
A partnership of Vaughan Engineering Limited and GEMTEC Limited completed the detailed design of the Sydney Landfill closure. This process has been an iterative one, beginning with pre-design evaluations of critical issues (Vaughan Engineering Limited and GEMTEC Limited 2001) and followed by a 60% Design Report (Vaughan Engineering Limited and GEMTEC Limited 2001a), a 95% Design Report (Vaughan Engineering Limited and GEMTEC Limited 2001b) and a 100% Design Report (Vaughan Engineering Limited and GEMTEC Limited 2001c). Each report presented critical issues, options, evaluations and recommendations for decisions. Each report built on the previous documents and developed a rationale for the decisions taken on the key design issues. Much of the information included in this report is from the Design Reports.

Sydney Landfill Pre-Design Closure Plan (January 2000)
This document, prepared by Jacques Whitford Environment Limited, presents a closure plan for the Sydney Landfill at a pre-design or conceptual level and provides background information. The Pre-Design Closure Plan provided the foundation for the later detailed design and sets out the requirements for additional information necessary to complete the detailed design.

Interim MAID Site Report (Draft). Phase II/III Environmental Site Assessment Muggah Creek Watershed (February 2001)
This interim report was prepared by JDAC Environment Limited as part a larger site assessment of the Tar Ponds/Coke Ovens site. The draft report presents the results of environmental and geotechnical investigations at the MAID site and surrounding areas.

Phase I Site Assessment (1999)
The Phase I Site Assessment of the Muggah Creek Watershed was commissioned as the first step in the environmental clean-up of all industrial lands in the project area. The study (CBCL Limited/Conestoga-Rovers & Associates Limited 1999) provides a summary of the environmental conditions within the watershed. This information has assisted the design and implementation of further investigations by compiling an overview of prior studies and providing recommendations for investigation and interim clean-up measures.

2.0 DESCRIPTION OF THE ENVIRONMENT

2.1 Climate / Air Quality

The CBRM regional climate is characteristic of the Nova Scotia Coastal Lowlands, where winter and summer temperatures are modified by the proximity to the Atlantic Ocean, as well as the prevailing westerly winds. Winters are traditionally cold but not severe. The daily mean temperature remains below 0°C for the months of December through March. Spring is late to arrive because of the persistently cold water and it is generally cool and cloudy. Mean daily temperatures are consistently above freezing by early April. Although temperatures warm rapidly, summers can remain relatively cool (July mean daily temperature is 17.6°C), again due to the nearby ocean.

Prevailing winds in Sydney generally blow from the west in winter and from the southwest in summer (see Figure 3). During storm events, winds from the southern quadrants tend to dominate. Winds from the easterly directions have the lowest frequency of occurrence. The average annual wind speed, from all directions, is 20 km/hr. Winds are generally the strongest in winter.

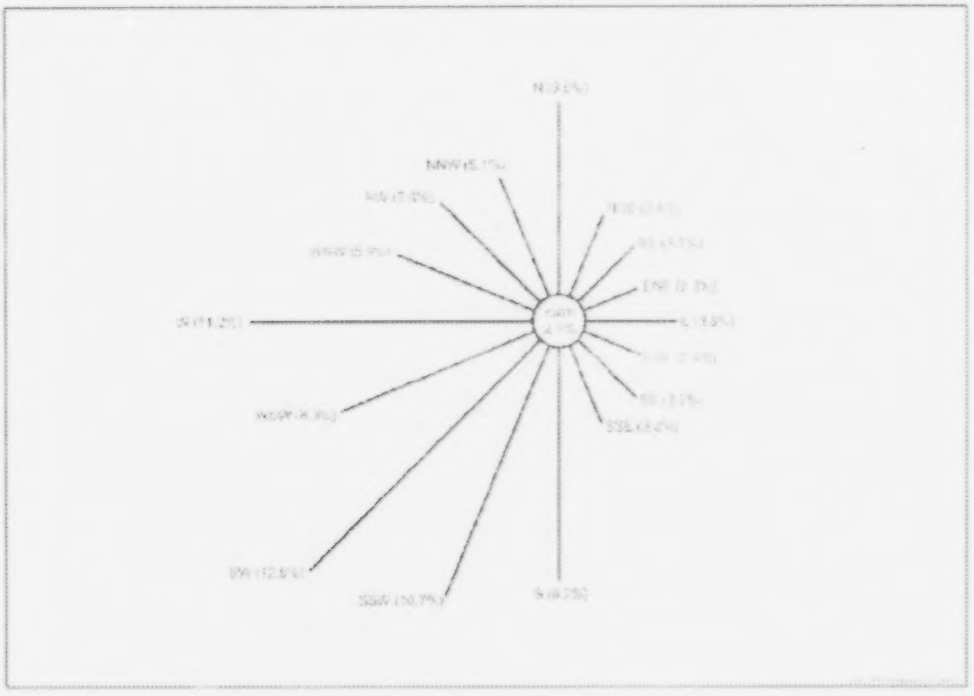


Figure 3. Sydney Wind Rose Diagram

The air quality in Sydney is monitored by both provincial and federal governments. Monitoring is carried out to determine the concentration of various substances and to compare these levels to accepted

standards. The 1999 data (AGRA Earth & Environmental 2000) showed that levels of the monitored parameters appear to be consistent with levels identified in selected suburban/urban airsheds in Canada.

Total suspended particulate (TSP) annual average levels have steadily decreased over the past 30 years (AGRA Earth & Environmental 2000). In the 1970s, TSP levels throughout the industrial Sydney area were generally around 60 mg/m^3. The highest levels were at Whitney Pier Fire Station where average levels were in the range of 117-121 mg/m^3. Annual averages dropped in the 1980s (28 mg/m^3) and 1990s (20-27 mg/m^3). The significant reduction over time is likely due to lower production rates at the SYSCO steel mill and the shut down of the Coke Ovens in 1988.

2.2 Geological Conditions

The base of the landfill is generally lowest in the southeast corner, rising midway along the western side. The soils underlying the landfill consist of a thin layer of peat underlain by silts/clays along the southeastern portion of the Site and extending along most of the eastern side. The combined thickness of these layers varies from less than one metre to about 1.5 metres.

Underlying the peat/silt is a layer composed of clay, silt, sand and gravel of glacial origin, commonly known as glacial till. Where the peat/silt layer is absent, the glacial till directly underlies the base of the landfill (along the western and northern sides). These soils are typically dense and relatively watertight. The glacial till is underlain by sandstone bedrock.

2.3 Hydrology / Hydrogeology

The old name, Marsh Dump, indicates that much of the original topography of the Sydney Landfill may have been marshy, similar to the area north of the Cape Breton Development Corporation (CBDC) railway line, with poorly defined watercourses which discharged to Coke Ovens Brook. At present, the MAID site receives upstream surface waters along the south side from Prince Street Brook, which drains an area towards Grand Lake Road, and from the wetlands east of the MAID site. These flows have been routed by various activities into MAID Pond. Present surface runoff from the landfill itself flows downslope in all directions, into MAID Pond, Coke Ovens Brook, or through intermittent watercourses along the toe of the slopes of the southwest and west sides.

The 1.4 hectare MAID Pond is located between a former tramway and the Sydney Landfill. The Pond did not exist in the 1960s but was formed during the various landfill operations on the MAID site since then. It is fed by surface runoff from the MAID site to the north and east, and from areas to the south. Coke Ovens Brook, which drains MAID Pond, now flows in an artificial channel constructed along the east and north sides of the Site. The Brook flows north-northwest around the Site to the railway line, then parallel to the railway embankment, where it meets tributaries draining the north valley flank.

The groundwater flow in the shallow bedrock follows the general topography flowing toward the Site from the higher ground to the north and south, then along the axis of the valley westward. The near surface groundwater flow is thought to be controlled by the slope of the relatively impervious glacial tills and clays under the Site and by modifications to the surface drainage which have been affected over the years as landfilling progressed.

Leachate which flows vertically down through the landfill tends to flow laterally along the surface of the underlying glacial till or peat/silt layer generally in a northeasterly direction and then westerly along the northern portion of the Site. There may also be windows in the glacial till through which leachate can

escape into the bedrock. These flows would be minute as recent test wells showed that the water level in the bedrock was lower than the overlaying till where leachate is pooled. Seasonally, leachate is expected to recharge Coke Ovens Brook during low flow periods--typically summer and fall. During high flow periods—typically winter and spring--infiltration may reverse with Coke Ovens Brook and MAID Pond recharging groundwater under the landfill. MAID Pond has a normal water level of 26 metres, and the Coke Ovens Brook along the east side, which has a very flat slope, also has a normal water level of approximately 26 metres. These levels are 3-4 metres above the base of the landfill.

2.4 Water Quality

Groundwater quality data for the bedrock system are contained in JDAC Environment Limited (2001) and are summarized in Table 1. In total 34 wells were sampled at the Site and on the adjacent CBRM site and 46 groundwater samples collected and analyzed. All samples were not analyzed for all analytical parameters. The water quality data does not reflect the quality of the leachate above the till layer. The potential for the till layer to attenuate or "filter" leachate as it migrates into the bedrock system is not known and, for this reason, it is difficult to predict leachate quality above the till.

JDAC Environment Limited (2001) also reports on surface water quality data from three sites upstream and downstream of the Site. Leachate impacts on Coke Ovens Brook were evident (see Table 2), based upon comparison of water quality down-gradient of the MAID site, to an up-gradient station. Increases in major ions, nitrate, ammonia, phosphorus, iron, manganese, hardness and total dissolved solids were evident. Canadian Council of Ministers of the Environment (CCME) *Water Quality Guidelines for the Protection of Aquatic Life* values for nitrate, ammonia, aluminum, copper, iron, manganese and selenium were typically exceeded in Coke Ovens Brook and Incinerator Brook.

In late March 2001, GEMTEC Limited (2001a) drilled eight additional monitoring wells and one borehole at the Sydney and CBRM sites. The results from the limited additional sampling done at these sites indicate that leachate from the CBRM site is less contaminated than leachate from the Sydney Landfill and that the leachate above the till on the Sydney site is more contaminated than is leachate in the bedrock on that site.

2.5 Fisheries / Aquatic Habitat

The Phase I report (CBCL Limited and Conestoga-Rovers & Associates 1999) noted that the marine and freshwater aquatic habitats of the Muggah Creek watershed all have experienced some human disturbance. Many of the streams located within the lower reaches of the watershed have been channelized and/or piped. With the possible exception of some of the small lakes and marshes in the upper reaches of the watershed, most watercourses have been impacted by both physical and chemical factors that affect water quality, stream hydrodynamics, and habitat productivity.

As part of this assessment a fish survey was carried out in MAID Pond, Coke Ovens Brook, and some Coke Ovens Brook tributaries (Foulds 2001). The study confirmed the presence of four species—Mummichogs, Banded Killifish, Ninespine Sticklebacks, and Brown Bullheads. Generally, the condition of the fish captured was very poor.

Table 1. Summary of Groundwater Quality - Sydney Landfill Site

Inorganic Parameters	• very hard • slightly acidic • elevated metals • high total dissolved solids • calcium - sulfate water
Mercury	one of 46 samples detected mercury (central area)
Cyanide	one monitoring well was positive
Radiological parameters	concentrations for gross alpha, beta and gamma elevated (relative to maximum background values)
Petroleum hydrocarbons	detected in one well only
EPA 625 (semi-volatile organic compounds)	exceeded background by factor of 8 to 50. CCME standard for benzo(a)pyrene exceeded
Polycyclic aromatic hydrocarbons (PAHs)	two wells contained elevated levels
Heterocyclic nitrogenous compounds (HNCs)	carbazole detected in 3 of 26 wells
PCBs	none detected in 20 wells
EPA 624 (volatile organic compounds)	detected in one well only

(modified from Vaughan Engineering Limited and GEMTEC Limited 2001c)

Table 2. Summary of Surface Water Quality - Coke Ovens Brook

Inorganic Parameters	metals, ammonia, sulfate, iron, boron, hardness, and Total Dissolved Solids concentrations elevated in relation to concentrations in an upgradient station
Cyanide	none detected
Mercury	none detected
Petroleum Hydrocarbons	none detected
EPA 625, PAHs, HNCs	no parameters present at detectable concentrations.
PCBs	none detected
EPA 624	no samples tested (Previous surface water tests indicated there were no 624 compounds present.)

(modified from Vaughan Engineering Limited and GEMTEC Limited 2001c)

2.6 Wildlife / Wildlife Habitat

The present surface cover on the south and west slopes of the Sydney Landfill is a mix of grass and scrub vegetation, with some small trees along the base of the slopes. Over the remainder of the Site and central area of the MAID site, a patchwork of waste and soil cover materials characterizes the surface. The northern perimeter area is partly covered by trees and scrub, and partly open, with sites of old building areas, railway lines, and roads. The western perimeter area is covered with grasses and small shrubs (JDAC Environment Limited 2001).

The industrial conditions and the impacted landscape limit suitability of the area to wildlife. Species reported to be present in the adjacent Coke Ovens/Tar Ponds area include Red Squirrel, Snowshoe Hare, Red Backed Vole, possibly, deer and/or coyote, muskrat, raccoons, fox, mice, rats, bald eagles, ducks, ravens, seagulls, songbirds, Yellowlegs, Smooth Green Snake, Green Frog, Leopard Frog, sow bugs, crickets, bumblebees, water striders, and snails (Haber 1998). Some of the same species may be found in the vicinity of the landfill.

2.7 Species at Risk

The Atlantic Canada Conservation Data Centre has provided Environment Canada with a scan of its data records to assist in determining whether species at risk are likely to be present at the Site. No rare animal species were identified. Two species of rare plants, wild chive and a variety of grass (*Elymus canadensis var wiegandii*) are known to occur in this map quadrant. Wild chive grows on calcareous rock on moist fissures in rock, on cliff or shore (mostly river shores). The variety of grass grows in rich intervales. Given the habitat requirements of the two plants, it is highly unlikely that either of them would be found at the Sydney Landfill (Atlantic Canada Conservation Data Centre 2000). It is unlikely that the project will interact with species at risk and this issue will not be considered further in the environmental assessment.

2.8 Land Use

Land use planning for this region is contained in the CBRM Municipal Planning Strategy and Land Use Bylaw. The Site itself is zoned either heavy industrial (HI) or light industrial (LI). Land to the immediate north and south is also zoned LI. Land to the northwest is zoned low density residential. North of the Site, beyond CBDC's rail line, most lands are currently undeveloped. However, there are two residential properties and one commercial operation on eastern Frederick Street located within a LI land use zone. The areas bordering Teak Street are zoned LI. Lands to the southeast are unzoned. The Coke Ovens site lies immediately west of the Site.

Residential areas can be found approximately 250 metres from the Site to the southeast in the Young Street area. Additional residential properties are found about 400 metres southwest of the Site along Forrest Street.

2.9 Health

There is a pronounced concern for human health issues in the Sydney area. A community consultation project was initiated by the Nova Scotia Department of Health in late 2000 to engage the community in an informed dialogue about health concerns related to the Muggah Creek watershed. A survey was initiated in the fall of 2000. Results are expected in fall 2001.

Reports related to health of the community in the project area completed to date include a mortality study investigating 118 causes of death between 1951-1994 (Band and Camus 2000), a study evaluating the incidence of cancer between 1981-1998 (Dewar 1999), and a study on birth outcomes among residents in Sydney and Cape Breton County (Dodds 1999). The Dewar study identified breast cancer in women, and colon cancer in males and in both sexes combined, as being significantly increased in Sydney compared to Cape Breton County, excluding Sydney. The mortality data lacks information regarding personal exposure to environmental, dietary, or any other lifestyle factors. Results of the birth outcomes study indicated a small increase in the rate of birth defects. There is a strong public perception that the high rates of cancer are directly attributable to chemical contamination in the area.

An acute human health risk assessment for exposure to chemicals found in the residential area north of the Coke Ovens site was recently completed and released to the public (HAS Engineers and Scientists 2001). In addition to further studies the report recommends, as a precautionary measure, immediate restriction of access to one site on the south side of Frederick Street.

2.10 Cultural Heritage

A heritage resources impact assessment of the Coke Ovens site, a portion of the Sydney Landfill, the Tar Ponds, and Coke Ovens Brook Connection was undertaken in the fall of 2000 (Jacques Whitford Environment Limited 2000a). The report notes that the Sydney Landfill is the highest point of land within the Muggah Creek watershed, and its natural grade is roughly 25 metres above sea level. The report states that, while there may be potential for prehistoric sites on the top of the hill, which would have provided an excellent vantage point, this is impossible to assess since there is landfill waste above natural grade. It concludes that there is either little heritage potential in, or no opportunity to effectively assess, the significance of the Site.

2.11 Traditional Use of Land and Resources by Aboriginals

Because of the past use of the Site and land use in areas immediately adjacent to the site, current use of land and resources for traditional purposes by aboriginal persons has been severely compromised.

3.0 PROJECT DESCRIPTION

3.1 Site Preparation

The top of the Site is generally flat with some low grades and depressions. The grading plan allows for additional waste material to be placed on the Site to improve surface drainage. Waste materials excavated during Site construction will also be placed on the top area. To ensure that the final elevation is achieved while minimizing hauling in clean fill, existing waste currently buried at the CBRM site may also be excavated and placed on the Sydney Landfill.

The steep north slope of the Site will be recontoured to reduce the currently steep angle of the slope to facilitate placement of the final cover and accommodate future long-term operation and maintenance activities (i.e. reduce erosion potential, facilitate equipment access). Significant excavation of waste will be required to reshape the slope from its present steep slope to a grade of 3:1 (horizontal to vertical) and to avoid alterations to the adjacent Coke Ovens Brook. The waste will be excavated and placed along the east slope. Waste relocation activities will generally be consistent with current waste filling activities. During excavation, a thin layer of soil cover may also be placed over incomplete areas overnight or over a weekend, if required to reduce dust or odour emissions or the potential for erosion.

By phasing the project, additional waste will be accommodated at the Site as it is being closed. During Phase I (2001), routine construction and demolition waste, petróleum contaminated soil, and Coke Ovens site construction and demolition waste will continue to be trucked to the Site. Additional fill will be available from the excavation of the Coke Ovens Brook diversion. The north slope will be recontoured late in the 2001 construction season to help prepare for Phase II (2002). In addition, excavated materials from the leachate collection pipe installation will be available for re-grading.

CBRM is responsible for the daily operation of the MAID site and will continue to have direct control over materials deposited at the Sydney Landfill during the period of closure. In additional to the existing controls, Vaughn Engineering Limited, the project's design and construction oversight consultant, will also have responsibilities for managing any materials brought to the site.

3.2 Final Cover System

The key component of the closure plan is the selection of an impervious cover to significantly restrict the amount of precipitation that infiltrates the waste deposits. The cover must be designed not only to reduce the generation of leachate but to remain essentially intact as settlement and other forces act on the Site. The NSDOE *Municipal Solid Waste Landfill Guidelines* set out the objectives of a cover system:

- to control the amount of surface water infiltration into the buried waste material;
- to limit erosion and sedimentation;
- to control the release of methane gas from the facility; and
- to protect the underlying waste from exposure.

A number of cover designs were investigated to determine the most environmentally sound, cost effective approach. The various options were modelled to estimate how well each would perform in terms of preventing infiltration of precipitation into the waste, and hence the volume of leachate that would be generated. Other issues were also considered, including capital cost and traffic generation, construction issues, maintenance, and impact on local economy. Two options were carried through to the final design and bidding stage. The base design will include the following layers:

1) a 375 mm grading layer (likely a combination of granular materials);
2) a 500 mm clay layer;
3) a 300 mm drainage layer (likely gravel);
4) 500 mm of borrow pit materials;
5) a 100 mm vegetative layer (topsoil or borrow material amended with lime and organic material).

The alternative final cover option involves installing a synthetic liner (in lieu of clay) over the top, flat portion of the landfill (not on the steeper side slope areas). The other design features remain unchanged. An advantage of the alternative option is reduced truck traffic because of reduced volumes of cover materials that need to be brought in from outside sources.

Calculations of landfill settlement have been made and the cover design adjusted accordingly.

3.2.1 Materials Availability

Based on the preliminary assessment, there are adequate quantities of cover materials readily available. Clay will be removed from an existing pit located approximately 13 kilometers west of the Site near Leitches Creek on Highway 223. Slag will come from the SYSCO site. Contractors will identify sources for the other cover materials.

Due to the lime content of slag from the SYSCO site, this material, if used, will likely be confined to the grading layer for the top flat section and incidental requirements such as access road surfacing. The PMC has evaluated recent sampling results from slag samples by comparing analytical results against Canadian Council of Ministers of the Environment (CCME) criteria. The conclusion was the slag material would be an environmentally acceptable fill material for this project. Slag is considered a co-product of steel production with a wide variety of uses including road construction, waste stabilization, cement manufacture, concrete aggregates and glass manufacture (Kalyoncu 1999).

Several options and sources of materials are being considered for the topsoil layer. The option of municipal compost will not likely be available, as compost will not be available until after the 2002 construction season, and the projected volumes are probably insufficient. Various other materials are being considered. These include various combinations of mineral soil, peat moss, lime and fertilizer.

A seed mixture will be applied over the prepared topsoil using standard hydroseeding techniques. Fertilizer and a stabilizing layer of straw mulch or biodegradable matting will be applied with the hydroseed / fertilizer material.

3.2.2 Potential Problems with Fires

The history of fires within the waste deposits has raised concerns with regard to future incidents and potential damage to the cover system. The occurrence of fires over the years has been sporadic with no single cause identified. The incidence of fires since normal operations at the Site were stopped has been minimal, which suggests that spontaneous combustion of the waste is not a problem. The speculation is that the fires were a result of activity on the Site, authorized or otherwise.

An infrared survey was completed May 2001 to determine if elevated temperatures were present within the waste. No heat sources above 250 ^{o}C at the surface of the landfill were detected and no further action is proposed.

Once the Site has been capped, the available pathways for oxygen to enter the waste include openings in the geomembrane or clay barrier and through the gas venting system. Proper construction procedures should result in a barrier system that will effectively prevent oxygen from entering the waste. The passive venting system should prevent the backflow of ambient air into the gas venting system.

3.3 Leachate Management

3.3.1 Leachate Volume

Leachate currently produced at the Site originates from a number of sources including precipitation, infiltration from MAID Pond and Coke Ovens Brook, and the upgradient CBRM site. The leachate pathways include seeps from the side slopes of the landfill, vertical downward movement into the bedrock, and lateral movement discharging into Coke Ovens Brook. At this point, there is insufficient data to accurately quantify the volume of leachate escaping into the bedrock system. The leachate that currently discharges into the Brook is "overflow" from a large volume (300 million litres) of leachate pooled under the Site.

The of combined leachate flows for the Sydney Landfill and the remainder of the MAID site is estimated to be 429,000 litres per day. This does not include leachate generated as a result of infiltration from MAID Pond and Coke Ovens Brook, which is probably substantial. From the current assessment of Site conditions, most of the leachate currently discharges into Coke Ovens Brook.

The primary method of reducing the volume of leachate will be the final cover system. It will prevent an estimated 98.5 per cent of precipitation from entering the waste, dramatically reducing the volume of leachate produced. Other methods of reducing the volume of leachate include reducing infiltration from MAID Pond and Coke Ovens Brook. With the capping of the Site, the diversion of Coke Ovens Brook and construction of the MAID Pond barrier wall, probably more than 50% of the current leachate flow will be eliminated.

3.3.2 Leachate Quality

In general, the JDAC Phase II report (JDAC Environment Limited 2001) results are indicative of relatively low strength leachate (see Section 2.4). There was no data available for biological oxygen demand (BOD) levels, however the fact that waste was burned at the Site until recently would suggest that the level of organics is probably low. An earlier study found a range of <2 to 12.3 mg/L for BOD in leachate samples (Cape Breton Environmental Group 1999). The highest level of dissolved organic carbon in the JDAC study was 32 mg/L, which is low for landfill leachate. What is typically of greater concern with leachate is elevated levels of the more "exotic" organics such as those measured by the EPA test protocols as well as petroleum hydrocarbons. The levels measured during the Phase II study are relatively low and may not represent a problem with regard to treatment. Attention will need to be given to address the radionuclides content. The alpha, beta, and gamma radiation levels are of concern and the determination of their origin/nature will be investigated as part of the on-going assessment of the Coke Ovens site.

3.3.3 MAID Pond Barrier Wall

The size, depth of water and proximity of MAID Pond to the landfill presents significant potential for water to infiltrate the waste. Options for dealing with MAID Pond were considered, including infilling of the Pond and construction of a barrier wall.

The selected option involves construction of a 570 metre barrier wall between the north side of the Pond (near the water's edge) and the landfill, to prevent migration of Pond water into the waste. The barrier wall will be constructed of an impermeable soil-bentonite slurry. It will have an overall surface area of 2000 m^2 with the bottom excavated into weathered bedrock and the top elevation at least 0.5 metres above the elevation of MAID Pond. The location of a gravel berm / working platform along the pond shoreline will be based primarily on site aesthetics, particularly the need to cover the existing exposed waste along the banks of the pond. Once the exposed waste is covered, the area will be graded and hydroseeded. The volume of waste between the wall and the pond is minimal.

3.3.4 Coke Ovens Brook Diversion

Coke Ovens Brook currently flows from MAID Pond along the east and then north boundaries of the site. This flow path adds to the potential for surface waters infiltrating the wastes and an increased volume of leachate. A second concern with the present channel is with respect to the placement of the cover for the Site along the north slope. Property ownership in this area places constraints on the design of the cover.

Four options for addressing these concerns were evaluated. The selected option is to divert Coke Ovens Brook through an open/piped diversion along the western side of the landfill. Approximately 260 metres of the realignment will be piped in a pre-cast concrete box culvert from MAID Pond along the southern portion of the landfill. The remaining 430 metres will be an open ditch along the western side of the landfill to connect back to the existing Brook at the northwest corner of the Site. Minor amounts of excavation and removal of waste along the south side will be required because of property restrictions. The waste will be placed back on the Site.

Figure 4 illustrates the proposed plan showing drainage areas, including surface drainage swales on the top of the landfill, the Coke Ovens Brook diversion, and the location of MAID Pond.

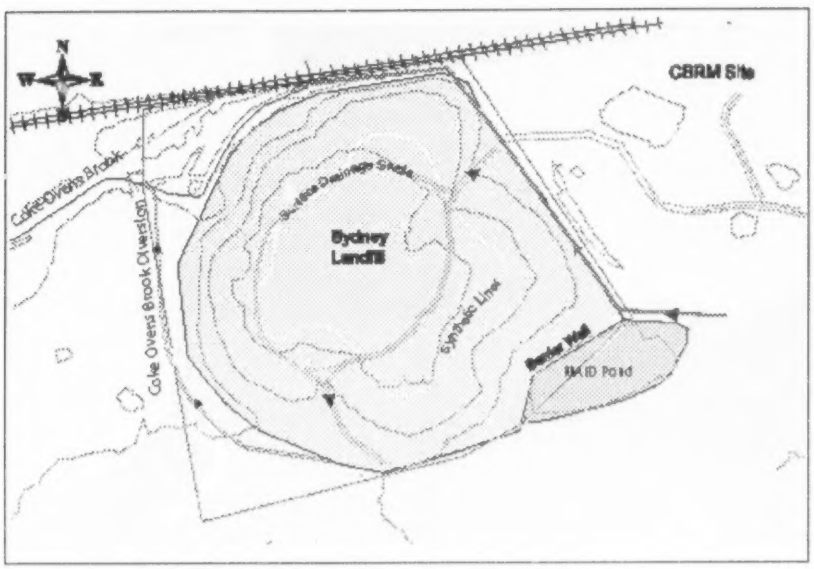


Figure 4. Proposed Surface Water Drainage

3.3.5 Leachate Collection

The proposed leachate collection system will be installed at shallow depths on the southwest side of the Site to capture seeps and discharge to Coke Ovens Brook. A northern interceptor will be installed at a greater depth and be designed to intercept the leachate as it emerges from under the Site, preventing migration of the leachate onto adjoining properties to the north.

Options for an east collector were examined. If a deep interceptor trench were to be installed to allow immediate drainage, approximately 300 million litres of pooled leachate would be pumped out, resulting in an average daily flow of 600,000 litres over 18-24 months. This volume is too large to be trucked off-site for treatment and there are no treatment systems currently available in the area to accept such wastes. An on-Site system designed to treat large volumes of landfill leachate for a short period of time is impractical.

A second option is to construct shallow interceptor trenches, for now, essentially to intercept the leachate flow from the Sydney and CBRM sites and prevent the leachate from surfacing in the area of the current Coke Ovens Brook. After the interceptors are installed, leachate flow and quality will be monitored to assess steady state conditions. A decision would then be made on how to treat the leachate on a long term basis and how best to deal with the pooled leachate under the sites.

The third, currently preferred option, is to install a deep collector, without dewatering the pooled leachate. The accumulated leachate would be removed over a lengthier period of time (maybe five to six years) therefore requiring the treatment system to be only marginally greater than the capacity required to deal with infiltration alone.

For the period of time until the leachate treatment system is completed, collected leachate will be diffused into Coke Ovens Brook in the northwest corner of the Site. This is essentially continuing the situation that currently exists.

It is a considerable challenge to recover leachate from a bedrock system given the cost of installing pumping wells, the ongoing operating and maintenance costs and the requirement to treat the large volumes of groundwater pumped from the wells. There is insufficient data to accurately quantify the volume of leachate escaping into the bedrock system. Under the proposed leachate management plan, this pathway would be monitored to establish a database on which to base a decision on whether to pursue recovery of bedrock leachate at a later time.

The Nova Scotia Department of Environmental and Labour (NSDEL) has stated that the leachate collection and treatment system must include provision for the long term input of leachate from all of the MAID site (NSDEL 2001). Should a deep collection system be required, the method of construction must be reviewed in light of the considerations for dewatering and the ability to handle the estimated quantities for treatment.

3.3.6 Leachate Treatment

Although leachate treatment is not part of the project being assessed, the following is provided for completeness.

Additional groundwater sampling and analyses is required before an appropriate leachate treatment system can be designed. The existing data indicates that treatment will likely have to address the organics content of the leachate (BOD), the elevated level of metals, ammonia, and radionuclides. Three general options are being considered - attenuation, an engineered facility, and leachate recirculation. Most of the leachate will, in the long-term, originate from the CBRM site, however the size of the treatment facility will depend in part on the time required to drain the pooled leachate under both the Sydney and CBRM sites. Bench scale testing of treatment alternatives will be conducted followed by detailed design and construction. Ongoing planning by CBRM for their municipal sewage plant at Battery Point could affect the decision-making for the landfill leachate. The plant could be used to treat the leachate.

3.4 Landfill Gas Management

The key design considerations for a landfill gas (LFG) management system include potential damage to the landfill cap, particularly if a geomembrane cap is chosen, environmental effects (due to greenhouse gases and trace compounds), nuisance odours, and potential safety problems with nearby structures (explosion).

The proposed LFG management system is passive and will focus on controlling gas pressures under the cover system that would otherwise cause degradation (cracking) or instability (reduce the factor of safety against sliding). The LFG collection system will consist of a series of 100 millimetre diameter perforated lateral collection pipes placed in clean stone. The laterals will be spaced at approximately 60 metre intervals. A series of vent pipes will be installed on the laterals located on the top section of the Site to provide venting. The piping will not extend under the side-slopes of the landfill.

3.5 Ancillary Activities/Facilities

3.5.1 Traffic Management

On-site traffic controls during the construction phase of the landfill closure will focus on the control of truck traffic into and out of the Site. Most of these vehicles will be under the control of the contractor who will be responsible for ensuring that there are no conflicts. The contractor will also manage

secondary effects such as the dust emissions and road maintenance. Normal traffic into and out of the CBRM disposal site will continue.

All waste hauling traffic now enters the MAID site through the incinerator access road (Deacons Lane). This site has no posted traffic controls. It is estimated that 215 to 250 trucks per day will be hauling material to the Site during the construction phase of the project. Access to the Site will be via Highway 125 or Highway 4 to Welton Street and Deacons Lane. Trucks leaving the Site will likely use a second access via Teak Street, Vulcan Avenue, and Maple Street, back to Welton Street at a controlled intersection. Other routes are being considered. Slag will be trucked to the Site from the SYSCO property.

Haul routes for transport of cover materials to the Site will be identified and scheduling restrictions will be implemented. On-site roads will be included in the closure design and will be maintained to permit access for closure activities and post-closure monitoring, inspection and maintenance.

3.5.2 Access Control

There is currently no traffic barrier between the Sydney Landfill and the remainder of the MAID site to the east. Vehicles that enter the MAID site from Welton Street are not directed by signs or fences and can easily access all areas. The second access road to Teak Street is gated and locked.

During construction, security gates will be installed at the two access points to the Site, Vulcan Avenue and the entrance point opposite the CBRM site. The gates will be locked when the Site is not being accessed by authorized personnel. At present, there are no plans to provide security fencing around the perimeter of the Site. The need for fencing can be evaluated later based on the level of uncontrolled activity on the Site. When approved waste materials are delivered to the Site in the construction off-season, authorized personnel will facilitate access and give direction on the disposal of incoming waste. At the end of the construction phase, no additional waste materials will be delivered to the Site.

A permanent Site access road will be constructed along the base of the landfill to allow service vehicles into the area to flush the leachate interceptor system. This road will also serve to provide access for inspection and monitoring. Due to close proximity of the current waste limits to the adjacent railroad tracks north of the landfill, the final cap will be constructed to the property boundary. An access road around the north side of the landfill is not possible.

Signs will be placed on both gates informing those attempting to gain access that the Site is off limits. Signs will inform the public of safety issues and warn of prosecution of unauthorized access. "No Trespassing" signs may be posted around the entire perimeter of the Site.

3.5.3 Pest Control

Prior to, during, and after the closure a contractor will be responsible for conducting a pest control program that will include placement of covered tamper-proof bait stations and use of a rodenticide.

3.5.4 Erosion Control and Storm Water Management

The control of erosion and sedimentation during the construction phase of the landfill closure presents engineering concerns such as protecting the integrity of the cover on the waste, and the capacity of the stream channels. The goal is to minimize damage to the environment and to improve the surrounding area.

The principles to be followed include minimizing erosion by limiting the area and time that soil is exposed, retaining sediment on-site, maintaining control measures, and monitoring implementation measures. The landfill capping design and associated drainage structures were designed to accommodate 1 in 100 year storm event. To minimize siltation, activities will be consistent with The *Erosion and Sedimentation Control Handbook for Construction Sites* (Nova Scotia Department of Environment, 1988).

The Sydney Landfill closure project will take place over two construction seasons. The provincial approval for this project will require control measures for erosion and sedimentation. Control measures may include:

- perimeter controls - silt fences to control sheet erosion;
- restriction of the amount of exposed soil at any one time - slopes will be stabilized as the work progresses;
- installation of sediment traps, both temporary and permanent;
- temporary runoff controls, including interceptor dikes, berms and drains - sand bags, geotechnical fabric and riprap will be kept on hand;
- three to four permanent protected drainage channels down the slopes in conjunction with a storm-water control berm around the upper flat portion of the Site; and
- protection of the new alignment of Coke Ovens Brook with riprap and seeding.

3.5.5 Health and Safety Considerations

Risk Management

A draft Risk Management Plan has been prepared by the PMC for the environmental clean-up of the Muggah Creek watershed. This plan establishes a program to systematically identify, analyze and respond to risks that have potential impacts on the scope, timelines and costs. The risks associated with undertaking the leachate management will be included in this overall risk management program. The plan focuses on the broader scope of issues that have an impact on the environmental clean-up of the Muggah Creek watershed, such as communications and information, technical quality, scheduling, cost, public support, health and safety, and legal/regulatory issues.

Health and Safety Planning

A plan to ensure the health and safety of workers and visitors to the site has been prepared by the PMC. The Master Health and Safety Plan (MHASP) for the environmental clean-up of the Muggah Creek watershed provides guidelines, requirements and procedures intended to protect the health and safety of the public and any person who enters a worksite.

The MHASP was developed using a reasonable and practical approach to implementing standard hygiene and safety practices that protect a worker or visitor and the public from identified hazards. It establishes minimum requirements. Specific activities may warrant more stringent health and safety requirements due to potential exposure to specific hazards and varying site conditions. As such, Project-Specific Health and Safety Plans are required to be prepared by each contractor undertaking an activity that recognizes the MHASP as a minimum standard. This requirement will apply to all contracts issued for this project.

A hazard assessment will be completed for all activities being performed at any property associated with the overall environmental clean-up of the Muggah Creek watershed. The hazard assessment will be included in the Project-Specific Health and Safety Plans and it will be used to confirm appropriateness of existing or proposed administrative and engineering controls, and hygiene practices. The results of the hazard assessment will be communicated to employees during health and safety meetings. Should an

assessment identify a hazard that poses immediate risk to workers or the public, this information shall be communicated to the PMC immediately, who will ensure that appropriate hazard mitigation steps are implemented.

Environment Canada is satisfied that mechanisms to address worker health and safety are in place. This issue will not be given further consideration in the assessment.

Emergency Response

In the event of an on-site emergency, the MHASP may be modified or temporarily suspended to permit proper rescue or handling of the emergency situation. An Emergency Response and Preparedness Plan (ERAPP) has been prepared for the environmental clean-up of the Muggah Creek watershed. The ERAPP supplements the MHASP and details the measures to be taken during a hazardous occurrence. A hazardous occurrence is defined as an event that has the potential to result in, or has resulted in a fatality, injury, property damage, or the release of hazardous materials.

The purpose of the ERAPP is to develop and implement an emergency response mechanism for hazardous occurrences that may arise during site clean-up operations. It presents procedures to address major site emergencies such as fires, explosions, and personal injury accidents requiring the assistance of emergency responders external to the site.

The community has the capability to respond to the nature of emergencies that may occur during the environmental clean-up of the Muggah Creek watershed. Funding for the necessary equipment and supplies and to provide training has been provided to CBRM as a result of a JAG recommendation.

3.5.6 Post-Closure Site Inspection

The Proponent will develop an operation and maintenance program for the Site, to be implemented following construction. This program will include a maintenance schedule and procedures for:

- erosion and sedimentation controls;
- surface and groundwater monitoring program;
- operation and maintenance of the methane management system; and
- operation and maintenance of the leachate collection and treatment system.

The Proponent will conduct post-closure Site inspections to ensure that controls are operating properly and that maintenance has been completed. Inspections will examine:

- Final cover – for deterioration;
- Landfill settlement and slope stability – for differential settling;
- Leachate seeps – for localized perched leachate or mounding;
- Surface drainage – for excess sediment, erosion, debris, blockages and contaminated surface water;
- Vegetative quality – for stress;
- Groundwater monitoring network – for required maintenance;
- Landfill gas management system – for required maintenance;
- Surface water monitoring stations – for erosion or other problems;
- Illegal dumping of waste;
- Site security and access – for required repairs, replacement, or enhancements; and
- Remediation measures – installed to correct previous problems.

3.5.7 Environmental Monitoring

Ambient air quality monitoring in support of clean-up activities in the Muggah Creek watershed has been ongoing since September 1998. Three stations monitor PAHs, total suspended particulates, and metals every 6 days. One station also monitors PM_{10}. One of the stations is at the east end of Frederick Street, near the Sydney Landfill Site. Data collected through 1999 have been analyzed and summarized (AGRA Earth & Environmental Limited 2000a). Similar reports are expected in subsequent years. Data will continue to be collected during the landfill closure period.

The proponent will develop a groundwater monitoring program (short term and long term) as part of operational requirements and to assist in decisions relating to leachate treatment. The short term groundwater monitoring program will include a pre-construction assessment of the Upper Frederick Street groundwater supplies situated north of the Site.

Meteorological conditions (precipitation, wind direction, wind velocity, temperature, and barometric pressure) and air quality will be monitored at the Coke Ovens site under an approval required by NSDEL during the period of that demolition project. This information may be available for use by the PMC for monitoring conditions at the adjacent Sydney Landfill.

4.0 PROJECT - ENVIRONMENT INTERACTIONS

4.1 Effects of the Project on the Environment

CEAA requires a decision as to whether a project is likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures. Potential effects of the project, classified as either positive or adverse, appear in Table 3. All project activities are included in the table, however only those components of the environment that are expected to be affected by a project activity are included. Where appropriate, effects on the environment are considered in relation to established criteria or guidelines. In many cases, those criteria or guidelines are human health related. A blank in the table indicates that no potential interaction of significance is expected between the project activity and that component of the environment.

The cost of the project is estimated to be in excess of $10 million dollars, much of which will be spent in the project area. Intangible social benefits will result from improved environmental conditions.

The components of the environment that will potentially experience net positive effects as a result of undertaking the project (see Table 3) are listed below.

- *Groundwater quality* - The volume of leachate produced will be decreased by installing the final cover system and the MAID Pond barrier wall, as well as by diverting Coke Ovens Brook. Contamination of groundwater will decrease as a result.

- *Surface water quality* - Leachate currently seeps out of the landfill uncontrolled into Coke Ovens Brook. Managing the leachate and diverting the Brook will have long-term net positive effects on surface water quality. It is recognized that the release of leachate from the landfill over the short term may not be in compliance with the *Fisheries Act*. Environment Canada, Office of Enforcement officials have agreed, however, that CBRM is exercising due diligence in undertaking the landfill closure project. The municipality must demonstrate continual progress or Environment Canada may be compelled to exercise its obligations under the pollution prevention provisions of the *Fisheries Act*.

  Construction activities could result in damage to water courses due to excessive siltation, however the project includes erosion control and storm-water management. The required protective measures, used routinely for construction projects, preclude the need for additional mitigation.

- *Aquatic habitat* - The alterations to MAID Pond and Coke Ovens Brook have been assessed in relation to *The Federal Policy on Wetland Conservation*. The policy focuses on wetland function: wildlife habitat, potential for rare and endangered species, recreational use, protected water area, significance of water recharge area, etc. Due to its degraded condition, the Pond and Brook currently provide little wetland function. The proposed activities will result in improvements: erosion will be controlled and storm-water managed; the MAID Pond barrier wall will replace a shoreline composed of waste materials with gravel/soil. Pollution of the aquatic habitat will therefore be prevented by controlling contamination at the source.

- *Wildlife habitat* - Preventing pollution of wildlife habitat by controlling contaminants at source will reduce contamination of terrestrial wildlife habitats. Capping the landfill, including planting vegetation, will have minor positive effects for wildlife habitat.

Table 3. Potential Effects of the Project on the Environment

Project Activities	Air Quality		Water Quality		Fish and Wildlife		Related Effects	
	landfill gas emissions (greenhouse gases and trace compounds)	*particulate matter emissions*	*groundwater quality*	*surface water quality*	*aquatic habitat*	*wildlife habitat*	*Odour*	*Noise*
Site Preparation								
Waste excavation and placement		-					-	-
Grading		-	-					-
Final Cover System								
Option: clay layer		-	+			+		-
Option: geomembrane		-	+			+		-
Leachate Reduction								
MAID Pond barrier wall		-	+		+			- -
Coke Ovens Brook diversion		-	+	+	+	+		-
Leachate Management								
Leachate collection		-	+	+				
Landfill Gas Management								
Passive LFG management	-						-	
Ancillary Activities								
Traffic management		-						-
Access control								
Pest control								
Erosion control & stormwater management				+	+			

\+ project areas with potential net *positive* effects on the environment

\- project areas with potential net *adverse* effects on the environment

The focus of the remainder of this section is the evaluation of these potential net adverse effects of the project on the environment.

4.1.1 Landfill Gas Emissions

Landfill gas (LFG) is produced at landfill sites containing decomposable organic wastes. Major constituents of LFG are methane and carbon dioxide. Trace compounds that may also be present include hydrogen sulfide, mercaptans (thiols), and volatile organic compounds. Landfill gases may result in a variety of adverse effects emissions of greenhouse gases, safety and health hazards, and nuisance effects such as odours (Conestoga-Rovers & Associates Limited 1996).

The need for an active gas management system--one is which LFG is captured and/or destroyed--at the Sydney Landfill was evaluated by the design engineers using the criteria in the EPA manual *Summary of the Requirements for the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills*. According to this document, landfills smaller than 2.5 million cubic metres are exempt from LFG management requirements. On this basis, the 1.3 million cubic metres Sydney Landfill would not require active LFG management for the purpose of controlling emissions. Also, according to *Guidance Document for Landfill Gas Management* (Conestoga-Rovers & Associates Limited 1996), this Site would probably have a "low" LFG production rate.

Destruction of landfill gases are required at some landfills of comparable size in Canada. The requirements at these sites all relate to nuisance odours. This is not expected to be a significant concern at this Site (see Section 4.1.3).

The relatively small size of the Sydney Landfill, the practice of burning during the period of active use, and comparison with appropriate guidelines, support the conclusion that the potential for adverse environmental and health effects from LFG are not significant. Additional mitigation measures beyond odour controls are not required.

4.1.2 Particulate Matter Emissions

Airborne particulate matter (PM) capable of being inhaled by humans are divided into two size ranges: $PM_{2.5}$ and PM_{10}. The "fine" particles less than 2.5 micrometers in size ($PM_{2.5}$) are responsible for causing the greatest harm to human health. These fine particles can be inhaled deep into the lungs reaching areas where the cells replenish the blood with oxygen. They can cause breathing and respiratory symptoms, irritation, inflammation and damage to the lungs and premature deaths. Some $PM_{2.5}$ is released directly to the atmosphere from industrial smokestacks and automobile tailpipes, but a large percentage is actually formed in the atmosphere from other pollutants such as sulphur dioxide, nitrogen oxides and volatile organic compounds. Fossil fuel combustion in motor vehicles, power plants and large industries, as well as industrial processes and solvent use are major sources of these other pollutants.

Although not as serious a threat to human health as $PM_{2.5}$, "coarse" particles covering the range up to 10 micrometers in diameter (PM_{10}) are also known to cause adverse health effects. When inhaled they tend to be deposited in the upper parts of the respiratory system from which they can be eventually expelled back into the throat. Coarse particles generally remain in the form in which they are released into the atmosphere without chemical transformation, eventually settling out under the influence of gravity. While some of these coarse particles are generated naturally by sea salt spray, wind and wave erosion, volcanic dust, windblown soil and pollen, they are also produced by human activities, such as construction, demolition, mining, road dust, tire wear and grinding processes of soil, rocks or metals.

PM_{10} is the most appropriate parameter for assessing the potential air quality and related health effects resulting from this project's airborne dust. The project will have an air monitoring program that includes monitoring at three fixed locations and real-time sampling when winds are from the north. Both total suspended particulates (includes particles larger than 10 micrometers) and PM_{10} will be included in the program.

Mitigative Measures:
Should monitoring results indicate air-borne particulate matter is at concentrations requiring action, mitigative measures will be taken. The measures, comparable to those normally employed during similar types of construction activities, that will be used, alone or in combination, are:

- wetting of roads or use of calcium chloride;
- sweeping or washing of the paved public roads leading to or from the Site;
- washing of truck tires as they leave the landfill support area;
- reducing vehicle speeds on the Site;

A factor that should minimize the impact that dust may have on the public is that winds during construction season, to the largest extent, are southerly and westerly. Almost all homes in the vicinity of the landfill are to the south. Areas to the north and northeast are undeveloped.

It is concluded that the potential for adverse effects from particulate matter should not be significant following implementation of the above mitigation measures.

4.1.3 Related Effects - Odour

Release of landfill gas (LFG) into the air may contribute to odours in the vicinity of the landfill. LFG odours are caused primarily by the hydrogen sulphides, mercaptans, and volatile organic compounds that are present in trace quantities in the gas. Although these compounds can present health concerns at much higher exposure concentrations, their first impacts relate to nuisance odours (Conestoga-Rovers & Associates Limited 1996).

Odour is mitigated to some extent by the use of suitable cover systems, however a final cover cannot be considered a stand-alone measure at small landfills. The greatest period of concern for nuisance odours is when the Site is receiving wastes and final cover has not yet been installed (Conestoga-Rovers & Associates Limited 1996). This Site, however, will not be receiving decomposable wastes during the period of project activities.

There have been no complaints relating to odours from the Site during the recent past. Exposure of waste during surface preparation activities will likely result in odour problems in the immediate vicinity of the Site. Strong odours were emitted during recent test excavations in the waste fill, but these odours dissipated quickly (JDAC 2001). Similar observations were made at a few of the monitoring wells during shallow drilling.

Mitigative Measures:
Special precautions will be taken while Site preparation is underway, including:

- Excavation of waste on the north face will be carried out during cooler weather (late October to mid-December 2001) to reduce the potential for odour and dust migration;

- Open garbage faces will be minimized as much as practically possible and the exposed face and relocated waste will be covered as soon as possible. A large stockpile of cover material will be maintained at the Site for this purpose;
- Use of emissions control foam during waste relocation activities or other trenching that might contact decomposing waste may be required in addition to standard dust and particulate control measures. Should foam, or something equivalent, be required, the contractor will submit information on the proposed product, including chemical constituents, to the construction oversight consultant prior to use; and
- The work will be carried out expeditiously.

There are no legislated requirements or guidelines related to odour in Nova Scotia. In British Columbia, the *Landfill Criteria for Municipal Solid Waste* requires an absence of a "public nuisance" related to odour. A public nuisance is defined as an activity that interferes with the reasonable use and enjoyment of property surrounding the landfill, is a source of irritation to the public, or is annoying, unpleasant or obnoxious to the public. Complaints from the public is the criterion used to measure nuisance odours.

Odour (and noise) is most likely to be a problem for the two residences and the one commercial operation at the east end of Frederick Street. The provincial government, recognizing that clean-up activities in the Muggah Creek watershed would disturb Frederick Street residents, has offered to purchase those properties. The offer remains valid should the residents and the owner of the commercial property decide they no longer wish to stay in their present locations.

Given the proposed mitigation measures, the separation distances, and the lack of history of odour complaints, the potential for adverse effects of odour as a result of this project are not considered significant.

4.1.4 Related Effects - Noise

The closest residential area south of the site is approximately 250 metres away. Noise has not been a public issue to date in relation to existing operations nor during a recent project that involved hauling large volumes of fill to the MAID site.

Based on estimated noise levels from heavy equipment and a simple formula that does not account for reductions in noise levels due to vegetation, topography, and other factors, there is potential for noise levels from the Site to exceed guidelines for community noise in a residential area (World Health Organization 2001). The criterion (50-55 dB) relates to annoyance and not hearing impairment.

Noise from highway construction projects are often viewed by the public as being short term and a necessary price for growth and improvement. Highway construction noise is generally addressed in a qualitative rather than quantitative manner and if potential construction noise impacts are identified, a common sense approach is utilized to incorporate appropriate abatement measures (U.S. Department of Transportation 1997). For this project, which is in many ways similar to highway construction, a similar approach will be followed.

Mitigative Measures:

- Landfill closure activities will be restricted to six days per week and to approximate daylight hours (Operating hours are currently expected to be 7 a.m. to 7 p.m. but may change with changing seasons.),

- Trucks will use a circle route to access the Site. This will reduce the number of trips per day on each route and the trucks using the more indirect streets would be empty.

The minimal residential development (currently one house) on the Teak, Vulcan and Maple proposed trucking route in an area zoned light industrial (see Section 2.8) would suggest that complaints regarding noise from off-Site truck traffic should not be an issue.

The NSDEL project approval will include a standard for sound levels measured at the Site property boundaries as follows:

- 65 dBA 0700-1900 hours (days);
- 60 dBA 1900-2300 hours (evenings);
- 55 dBA 2300-0700 hours (nights).

Given mitigation and the level of complaints during past operations, the potential for adverse effects from noise is not considered significant.

4.2 Effects of the Environment on the Project

CEAA requires that the effects of the environment on the project be assessed. The project design has already considered these effects and has made appropriate adjustments. Examples of how the project design has been adjusted include:

- The project will not be undertaken in winter, as weather conditions are not favorable to construction;
- To minimize odours re-contouring of the north slope of the Site will be carried out during late fall;
- Seeding and mulching of the slopes will be done progressively in the early part of the growing season or late in the summer. This will allow the seed to germinate and the growth to be well established prior to dry seasons when relatively minor rainfall events can cause considerable damage, and prior to the cold wet weather of the fall season.
- The landfill capping design and the associated drainage structures were designed to accommodate the one-in-100-year storm.
- The contractor will be required to control secondary impacts such as the potential for dust emissions and Site road maintenance under all weather conditions. Performance standards for the control of dust on the Site will be included in the contract documents.

Further adjustments to the project design are not considered necessary at this time.

4.3 Cumulative Environmental Effects

CEAA requires consideration of any cumulative environmental effects that are likely to result from the project, in combination with other projects or activities that have been, or will be, carried out.

A cumulative effects analysis was carried out for the environmental assessment of the Coke Ovens Clean-up project earlier this year (Environment Canada. 2001). The results of that analysis were used to identify projects where cumulative effects may be of concern. Added to the list of projects previously identified were Kings Road Reconstruction and demolition activities on the SYSCO property.

Table 4 identifies where potential net positive and adverse cumulative effects may be experienced. (Only those components of the environment where effects are expected in relation to the landfill closure project are included in Table 4). Each is discussed below.

Muggah Creek Interceptor Sewer Project - Construction and operation of a sewer collector system and related facilities will intercept flows from approximately 30 existing outfalls surrounding Muggah Creek and the Tar Ponds. The interceptor sewer will eventually convey sanitary sewage from all of Sydney to a proposed wastewater treatment plant at Battery Point. This is a 2-year project to begin in the fall of 2001.

The only areas of potential cumulative effects of this project with the landfill closure relates to particulate matter emissions and noise from trucking. These effects will likely be minimal as the routes used by the trucks from the two projects travel on different routes, there are far fewer trucks involved with the interceptor sewer project, and the interceptor sewer project is located well over a kilometer away from the landfill.

Interim Remediation of Tar Cell - The remains of a shallow lagoon on the Coke Ovens site that received coal tar overflow from aboveground storage tanks may be covered in early summer 2002. Placement of a proper cover will reduce surface seepage of tar and prevent direct contact or contact with water or wind eroded materials.

Should the interim remediation of the tar cell proceed it will take place during Phase II of the Sydney Landfill closure and it will be subject to a federal environmental assessment. Some trace compounds emissions from the tar cell contents are likely to occur during remediation activities, as are particulate matter emissions due to trucking and placement of the soil cover. However, the tar cell is over 1200 metres from the landfill and effects will be managed to protect nearby residences. A significant cumulative effect resulting from the two projects seems unlikely. Air quality monitoring data for the landfill closure will be reviewed during the environmental assessment of the Tar Cell project to confirm this conclusion.

Coke Ovens Site Clean-up - Derelict structures and residual materials may be removed from the Coke Ovens site during the landfill closure period. Some of the waste materials will be landfilled at the Sydney Landfill site.

Table 4. Potential Areas of Cumulative Effects - Initial Assessment

Project Activities	Air Quality		Water Quality		Fish and Wildlife		Related Effects	
	landfill gas emissions (trace compounds)	*particulate matter emissions*	*groundwater quality*	*surface water quality*	*aquatic habitat*	*wildlife habitat*	*Noise*	*Odour*
Environmental Clean-Up of Muggah Creek Watershed								
Muggah Creek Interceptor Sewer Project		-					-	
Interim Remediation of Tar Cell	-	-						
Coke Ovens Site Clean-up	-	-	+	+			-	
Other Projects								
Ongoing MAID Site Activities	-	-	-	-			-	-
Kings Road Reconstruction		-					-	
SYSCO Demolition Project		-						

\+ potential areas of net *positive* cumulative effects

\- potential areas of *net adverse* cumulative effects

Separation zones for various key parameters were predicted for the Coke Ovens site clean-up project (AGRA Earth & Environmental 2000). The figures in that report represent the outer "footprints" of the areas that could be expected to have ambient air concentrations issues related to some of the trace compounds included in LFG emissions. However, the direction of prevailing winds, west and southwest, and the spatial relationships among the project sites and the residential areas, work in favour of avoiding cumulative effects as does the current schedule of the individual clean-up activities at the Coke Ovens site.

The number of trucks used for the Coke Ovens site clean-up (30 per day) is small compared to the number for the landfill closure project (250 per day) and normal landfill operations (500 per day). The cumulative effects of dust from the Coke Ovens site is quantitatively relatively insignificant. Effects of trucking from the landfill closure project are addressed in Section 4.1. Measures to mitigate the dust effects of trucking on the Coke Ovens site specifically was discussed in the screening report for that project.

There could be cumulative noise effects in the Forrest Street area from landfill activities and demolition of the By-products Building, however, the two activities overlap very little in schedule. Also, landfill activities at the time of the demolition will be on the far side of the Site.

Ongoing MAID Site (CBRM) Activities - The MAID site area immediately east of the Sydney Landfill (referred to as the CBRM site in this report) continues to accept waste as the operational waste disposal site for CBRM. CBRM expects the site to continue in use for two to three years.

Normal operations of the CBRM site include incineration, landfilling of ash, white metals, construction and demolition wastes, and composting. The potential for LFG emissions is minimal with these operations. The potential for adverse cumulative effects of LFG from the CBRM site and from the Sydney Landfill closure activities is unlikely and not significant. Issues relating to odour, if they occur, would likely only be short-term (during the closure activities). The buyout proposal in place for the Frederick Street residences potentially affected by odour and noise addresses both the direct and cumulative effects of the Sydney Landfill closure activities.

Truck traffic resulting from normal operations of the MAID site amount to approximately 500 trucks per day. The cumulative effect of trucking from this source and from the Sydney Landfill closure (an additional 215-250 trucks per day) relates particularly to particulate matter emissions and related effects of noise. Mitigative measures to control effects of trucking have been proposed in Section 4.1 above. As operator of the CBRM site, the municipality could implement similar measures at the second side should monitoring indicate the potential for a significant and cumulative air quality effect.

It is recognized that once the Sydney Landfill closure is complete, most of the leachate will be produced from the CBRM site. The adverse environmental effects of MAID site operations on groundwater quality and surface water quality are expected to continue until leachate treatment is in place. Some measures, such as re-grading or controlled phase-out, have been proposed to mitigate environmental effects on groundwater and surface water, however, none are approved at this time. Implementation of these measures would significantly reduce these effects.

Kings Road Reconstruction - CBRM plans to reconstruct Kings Road, a main arterial road into Sydney. The project will include adjustments to the road alignment, improved road elevations, and increased number of lanes. The project will also include the upgrading of the water main along Kings Road, the

reconstruction of all road infrastructure and the resurfacing of the street. The construction schedule is not certain at this time.

The project is similar to the Interceptor Sewer project and the nature of environmental effects would be similar. The potential for adverse cumulative effects should be less than that for the Interceptor Sewer project as the distance to the Sydney Landfill is greater (approximately 3 kilometers).

SYSCO Demolition - Beginning in August 2001 and continuing for two years a contractor will be demolishing buildings located on the provincially owned SYSCO site.

Activities will be similar to some of the activities scheduled for the Coke Ovens Site Clean-up and environmental effects are also likely to be similar. The air quality modelling conducted for that project (AGRA Earth and Environmental Limited. 2000) predicts air-borne particulate matter to be an air quality parameter of concern for the demolition of the By-products building. However with controls that area of concern was predicted to extend only for a distance of approximately 300 metres. Similar controls—wetting down structures, air quality monitoring, and air quality trigger levels--are to be used for SYSCO demolitions. A cumulative particulate matter effect is most likely to occur in the Forrest Street area. Such an event would require air-borne particulate matter to travel more than twice the distance predicted for demolition the By-products building. Factoring in the direction of prevailing winds and the spatial relationship among the SYSCO site, the Forrest Street area, and the Sydney Landfill, there is little likelyhood of a cumulative effect.

4.4 Effects Related to Accidents and Malfunctions

CEAA requires consideration of the environmental effects of malfunctions or accidents that may occur in connection with the project. The PMC has prepared a Master Health and Safety Plan (MHASP) for all Muggah Creek watershed clean-up activities, including this project. The plan will ensure safety requirements are implemented. In addition to the MHASP, there will be project-specific health and safety plans developed by each individual contractor working on the Site to address the particular risks associated with their construction activities. The plans will meet or exceed the requirements of the provincial *Occupational Health and Safety Act* Regulations and the MHASP.

Between 215 and 250 truck trips per day are estimated to be required to complete this project, depending on the final cover system option chosen. This could amount to a total of 4,300,000 to 5,000,000 kilometres travelled. A prediction of injury collisions and fatalities was made using United States Department of Transportation statistics. The results show that if 28 accidents were to occur per 100 million kilometres travelled, 1.16 - 1.35 accidents may occur over the period of the project. This level is considered the lowest reasonably achievable accident rate. At a rate of 1.6 fatalities per 100 million kilometres travelled, a fatality over the period of the project is an unlikely occurrence.

The District Traffic Authority of NSTPW reviewed the trucking aspects of the project and concluded that with respect to the trucking of clay there was no need for a traffic impact assessment. The Authority did have concerns with trucking of other materials and the possible use of access ramps to Highway 125 at Exits 7 and 8. Through contractual requirements the PMC has taken measures to prohibit trucking contractors from using these exits.

Given the level of preparedness for accidents and malfunctions by all partners associated with the project, the likelihood of these events occurring, and resulting in significant harm, has been minimized.

5.0 IMPLEMENTATION OF MITIGATION AND FOLLOW-UP

Environment Canada will work with JAG, the Province of Nova Scotia, and Cape Breton Regional Municipality (CBRM) to ensure that required mitigation measures are implemented.

The NSDEL approval for the project will include a requirement for an Environmental Management Plan. The plan will address erosion control, groundwater monitoring, air-borne particulate emissions, noise levels, and spills. EC will participate in review of the environmental management plans and monitoring results to assist in ensuring its follow-up requirements are met.

As part of its overall environmental assessment responsibilities under CEAA, Environment Canada has a program designed to ensure follow-up activities occur on selected projects where the department has assessment and/or regulatory duties. The program will consider the Sydney Landfill Leachate Management Project as a candidate for evaluation of the effectiveness of the departmental follow-up program.

In addition to the procedures outlined above Environment Canada has other mechanism available to assist in ensuring implementation of mitigation measures. As administrator of federal funds, the department can use the funding mechanism to strongly influence the project's decision-makers.

6.0 CONSULTATIONS

In April 2001, a discussion document outlining the project and possible environmental effects was prepared by Conestoga-Rovers & Associates and Environment Canada. It was distributed to government agencies and JAG members to initialize discussions about regulatory requirements and expected environmental effects. The discussion document was also made available to the public through JAG, posted on the publicly accessible JAG web site (www.muggah.org), and provided directly to selected stakeholders by Environment Canada.

In May 2001 a draft environmental assessment screening report was made available for review and comment to governments, JAG, and the public. The report was posted on the JAG web site; notification that the report was available appeared in the local newspaper. On June 7 Environment Canada, JAG, and the PMC held a community consultation session on the project. Environment Canada also contacted a number of special interest groups, providing them with a copy of the draft screening report. Comments received up until July 3, 2001 were reviewed and considered in the preparation of the final report.

Government agencies and other organizations involved in review of the environmental assessment included:

- Canadian Environmental Assessment Agency
- Health Canada
- Natural Resources Canada
- Fisheries and Oceans Canada
- NS Department of Transportation & Public Works
- NS Department of Health
- NS Department of Environment & Labour
- NS Department of Natural Resources
- NS Department of Tourism and Culture (Museums)
- Membertou First Nation
- Joint Action Group

7.0 ASSESSMENT DECISION AND COURSE OF ACTION

Based on the information gathered to date, and the results of the screening, Environment Canada (the Responsible Authority) has concluded, in accordance with Section 20 of the *Canadian Environmental Assessment Act*, that **significant adverse environmental effects are not likely, taking into account implementation of the identified mitigation measures and that public concerns do not warrant referral of the project to a mediator or a review panel.**

Prepared by: Environment Canada

Approved by: _____

Diane Giffin-Boudreau
Director, Sydney Tar Ponds / Coke Ovens Clean-Up Project
Environment Canada

Date: August 10, 2001

This screening report is available to the public. To obtain a copy, contact:

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APPENDIX A - APPLICABLE LEGISLATION

Legislation	Section	Application to this Project	Reponsible Agency	Comment
NS *Environment Act* - Activities Designation Regulations	Division I - Water Approvals: use or alteration of a watercourse	Construction of MAID Pond barrier wall and diversion of Coke Ovens Brook	NSDEL	
NS *Environment Act* - Activities Designation Regulations	Division III - Municipal Waste Approvals - Part 2 Solid Waste: Construction, operation or reclamation of a municipal solid waste management facility	Reclamation of the Sydney Landfill	NSDEL	Draft approval for closure of a Municipal Solid Waste Landfill, Phase I, received June 7, 2001. Terms and conditions of the approval are included.
NS *Environment Act* - Activities Designation Regulations	Division V - Industrial Approvals - Part 2 Construction: Construction, operation or reclamation of a pit or quarry	Required if a new pit or quarry is required to supply clay cover materials.	NSDEL	
NS *Environment Act* - Environmental Assessment Regulations	Class I Undertaking - Pit or quarry in excess of four hectares in area.	Required if a new pit or quarry is required to supply clay layer for capping, and it is larger than four hectares.	NSDEL	
NS *Environment Act* - Air Quality Regulations	Section 4 - Criteria for ambient air quality expressed as maximum permissible ground level concentrations shall not be exceeded.	Maximum permissible ground level concentration for Total Suspended Particulate (TSP) of 120 g/m3 (24 hour mean).	NSDEL	
NS *Occupational Health and Safety Act* - Duties and Precautions	Sections 13 - 23	On-Site worker health and safety	NSDEL	
Fisheries Act	Section 35 - No person shall carry on any work or undertaking that results in the harmful alteration, damage, or destruction of fish habitat.	Diversion of Coke Ovens Brook.	DFO	
	Section 36 - No person shall deposit a deleterious substance of any type in water frequented by fish.	Leachate discharge into Coke Ovens Brook.	EC	Leachate is entering Coke Ovens Brook, which eventually runs into Sydney harbour. The leachate would likely fail the acute lethality test for fish and be considered a deleterious substance.
	Section 78.6 - No person shall be convicted of an offence if the person establishes that they exercised all due diligence to prevent the commission of the offense.	Leachate treatment system will be built to prevent deposition of a deleterious substance into Coke Ovens Brook.	EC	EC, Environment Protection Branch, Office of Enforcement, believes that this project would be construed by a court to be an exercise of due diligence, under the circumstances.
Migratory Birds and Convention Act Regulations	Section 6 - No person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird except under authority of a permit.	Possible disturbance of migratory birds.	EC	
	Section 35 - No person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.	Leachate discharge into Coke Ovens Brook.	EC	EC, Environment Protection Branch, Office of Enforcement, believes that this project would be construed by a court to be an exercise of due diligence, under the circumstances.

APPENDIX B - LIST OF ACRONYMS

BOD	biochemical oxygen demand
BTEX	benzene, toluene, ethylbenzene, and xylene
CBRM	Cape Breton Regional Municipality
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Act
DFO	Department of Fisheries and Oceans
EC	Environment Canada
EPA	US Environmental Protection Agency
ERAPP	Emergency Response And Preparedness Plan
HNCs	heterocyclic nitrogenous compounds
JAG	Joint Action Group for Clean-up of the Muggah Creek Watershed
LFG	landfill gas
MAID	Municipal-Ash-Industrial Disposal
MHASP	Master Health And Safety Plan
NSDEL	Nova Scotia Department of Environment and Labour
PCBs	polychlorinated biphenyls
PMC	Project Management Consultant
SYSCO	Sydney Steel Corporation